

Claim Amendments

1. (currently amended) A method for detecting a target molecule or target molecules, said method comprising:

(a) bringing a plurality of electrodes supported by a semiconductor substrate into proximity with a reaction medium comprising a sample suspected of containing a said target molecule or target molecules, each of said electrodes comprising at least one target probe that binds to a target molecule to form a bimolecular complex, said target probe having covalently coupled thereto a redox active moiety selected from the group consisting of transition metal complexes and non-enzymatic organic electron donors and acceptors or said target probe having attached thereto one member of a non-enzymatic ligand-bioconjugate pair that binds to the other member of a said non-enzymatic ligand-bioconjugate pair comprising a redox active moiety selected from the group consisting of transition metal complexes and non-enzymatic organic electron donors and acceptors,

(b) selectively addressing a plurality of cells within said semiconductor substrate

(i) to apply a stimulus to each of said electrodes to activate a predetermined redox active moiety that is associated with an electrode, and

(ii) to detect, by means of said electrodes, corresponding responses produced as a result of said activation of said redox active moieties, the magnitude of said corresponding responses indicating the presence or absence of a said target molecule or target molecules in said sample.

2. (original) A method according to Claim 1 wherein said stimulus is voltage or current and said corresponding response is current or voltage, respectively.

3. (original) A method according to Claim 1 wherein said cell is addressed digitally.

4. (original) A method according to Claim 3 wherein said stimulus is applied using an analog bus, which cooperates with circuitry on or off said semiconductor substrate to apply said stimulus to said electrode, and wherein said corresponding response is detected using an analog bus, which cooperates with circuitry on or off said semiconductor substrate to detect said corresponding response from said electrode.

Claims 5-10. (canceled)

11. (original) A method according to Claim 1 wherein said detecting comprises the use of voltammetry or potentiometry.

12. (currently amended) A method for detecting a target molecule or target molecules, said method comprising:

(a) bringing a plurality of electrodes supported by a semiconductor substrate into proximity with a reaction medium comprising a sample suspected of containing a said target molecule or target molecules, each of said electrodes comprising at least one target probe that binds to a target molecule to form a bimolecular complex, said target probe having covalently coupled thereto a redox active moiety selected from the group consisting of transition metal complexes and non-enzymatic organic electron donors and acceptors or said target probe having attached thereto one member of a non-enzymatic ligand-bioconjugate pair that binds to the other member of a said non-enzymatic ligand-bioconjugate pair comprising a redox active moiety selected from the group consisting of transition metal complexes and non-enzymatic organic electron donors and acceptors,

(b) selectively applying electrical signals to each of said electrodes to activate a predetermined redox active moiety that is associated with an electrode, and

(c) detecting, by means of said electrodes, corresponding electrical signals produced as a result of said activation of said redox active moieties, the magnitude of said corresponding electrical signals indicating the presence or absence of a said target molecule or target molecules in said sample.

13. (original) A method according to Claim 12 wherein said selectively applied electrical signals are voltages and said corresponding electrical signals are current or potential difference or a combination thereof.

Claims 14-20. (canceled)

21. (original) A method according to Claim 12 wherein said detecting comprises the use of voltammetry or potentiometry.

Claims 22-56. (canceled)

57. (previously presented) A method of testing a sample for the presence of target

nucleic acids, said method comprising:

(a) applying said sample to an array of test sites in multiple locations on a surface of an integrated circuit, each site having oligonucleotide probes formed therein of known hybridization characteristics wherein the oligonucleotide probes in each test site differ from the oligonucleotide probes in other test sites in a known predetermined manner such that the test site location of oligonucleotide probes and their hybridization characteristics are known;

(b) treating each test site to which a target nucleic acid is hybridized, to extend the length of each oligonucleotide probe thereby incorporating an electronically responsive detector agent into each of said oligonucleotides, wherein said electronically responsive detector agent is selected from the group consisting of transition metal complexes and non-enzymatic organic electron donors and acceptors;

(c) applying selectively an electrical signal to each of said test sites by means of circuitry associated with said integrated circuit, said electrical signal being sufficient to activate said electronically responsive detector agent associated with an electrode; and

(d) detecting selectively by means of said integrated circuit a change in electronic properties of the test sites resulting from the hybridization of target nucleic acid to lengthened oligonucleotide probes in the test sites by detection circuitry coupled to individual test sites to determine which target nucleic acid has hybridized to a test site; whereby the presence of a multiplicity of different target nucleic acids in the sample is detected.

58. (original) A method according to Claim 57 wherein said oligonucleotide probes are DNA probes or RNA probes.

59. (original) A method according to Claim 57 wherein said detecting comprises the use of voltammetry or potentiometry.

Claims 60-61. (canceled)

62. (previously presented) A method according to Claim 1 wherein said at least one target probe is an oligonucleotide probe and said redox active moiety is covalently attached to a nucleotide of said oligonucleotide probe.

63. (previously presented) A method according to Claim 62 wherein said redox active moiety is covalently attached to the 3' or 5' nucleotide of said oligonucleotide probe.